



Beyond the networks

Self-help services and post-settlement network extensions in the periphery of Dar es Salaam

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Beyond the networks: Self-help services and post-settlement network extensions in the periphery of Dar es Salaam

Abstract

This paper offers insights from comprehensive case studies of rapidly growing peripheral settlements of Dar es Salaam. The paper explores how a broad range of services and infrastructures have developed and improved over time, and how residents have been engaged in this in various ways. The gradual improvements in services and infrastructure are to some extent created, organized and financed by residents through informal self-help solutions, which are often costly and place huge strains on residents' time and resources. Alongside this, residents are also involved in attracting formal service providers through applications, co-financing of network extensions as well as lobbying efforts towards urban authorities and service providers. The formal service providers primarily take a reactive role, responding to demand, requests and political pressure from residents. Post-settlement network extensions are often complicated and impeded by costly and cumbersome land-acquisition processes, and because of the reactive and often piecemeal approach to network extensions, society may be missing out on potential benefits of scale. The way urban services work also means that the provision of services and infrastructure is extremely differentiated and fragmented across the urban territory, creating and reinforcing major inequalities in access to services.

Keywords: Urban services; urban infrastructure; urban expansion; urban peripheries; peri-urban

Introduction

Urban expansion is a significant trend in the cities of Africa (Angel et al. , 2011, Arku, 2009). Much urban expansion is taking place “beyond the networks”, in areas where infrastructure and basic services are either inadequate or non-existent (Chitonge, 2014). Long-term under-investments have resulted in networks lagging far behind the demographic as well as the spatial growth of the cities (Foster and Briceno-Garmendia, 2010, Keener et al. , 2010, Pieterse and Hyman, 2014, Pitcher and Murray, 2007, Torres et al. , 2012). The provision of networked services and infrastructure is highly unequal and in most cases limited to a relatively small metropolitan core, with the peripheries of the cities suffering significant deprivations (Allen et al. , 2006, McGranahan et al. , 2009, Myers, 2014, Van Dijk et al. , 2014).

The systematic failures of African states to provide basic services and essential infrastructure in their cities are widely acknowledged. More recently, scholars have begun calling for a radical change in perspective, taking as starting point not the failures of urban service provision, but how urban services actually work, and the many ways in which urban residents fill the gaps left by public and private service providers. Simply listing deprivations does not say anything about how services are actually produced and provided (Simone, 2010). Instead scholars call for an empirically grounded study of services and infrastructure, focusing on the heterogeneity of actual service delivery systems (Jaglin, 2014, Pieterse and Hyman, 2014), the actors, institutions and processes involved in the provision of services (Bierschenk and de Sardan, 2014, Blundo

and Le Meur, 2009) as well as the capabilities of residents in servicing their settlements (Pieterse, 2008, 2014, Simone, 2014). It is the ambition of this paper to contribute to this emerging agenda.

This paper offers insights from recent case studies of five rapidly growing peripheral settlements in the periphery of Dar es Salaam, the largest city and de-facto capital of Tanzania. Services and infrastructure were seldom in place in these settlements before housing development began, but some level of services and infrastructure has emerged along the way. The study explores how services and infrastructure have developed and improved over time, and how residents have been engaged in this process in various ways. This makes it possible to gain a holistic understanding of how urban services work and how residents manage to make their settlements liveable through a broad range of different strategies.

While not part of the above-mentioned research agenda, other studies of peripheral urban settlements do note the capabilities and resourcefulness of residents in relation to service provision. In a study of Lagos, Nigeria, Sawyer comments that improvements in services and infrastructure are primarily due to the efforts, investments, organization and networks of the residents themselves (Sawyer, 2014). In a study of Luanda, Angola, Buire remarks the importance of small-scale improvements made by residents (Buire, 2014). In a study of Accra, Ghana, Gough reports that new settlers form residents' associations, which are actively engaged in service provision (Gough, 1999). Ibem reports how community groups in Ohafia, Nigeria, are involved in financing services and infrastructure improvements (Ibem, 2009). For Dar es Salaam a number of studies of peripheral settlements report how services have been developed and improved gradually by residents (Burra, 2004, Kombe, 2000, Kombe, 2005, Kyessi, 2005, Owens, 2010). These studies, however, rarely share the focus of this paper on services as the main object of investigation.

Other studies have explored how residents in urban peripheries access a specific service, often either water or sanitation, through various informal solutions. Some studies highlight the widespread practice of drilling private wells and boreholes (Allen, Dávila, 2006, Kyessi, 2005, Manzungu and Chioreso, 2012, Mwakalila, 2007, Nnaji et al. , 2013). Others note the prominence of private on-site sanitation facilities (Njoh, 2013, Van Dijk, Etajak, 2014). Some emphasize the significance of informal, small-scale, commercial operators, esp. in relation to water provision (Allen, Dávila, 2006, Chakava et al. , 2014, Chitonge, 2014, Kyessi, 2005, Manzungu and Chioreso, 2012, Mwakalila, 2007, Nnaji, Eluwa, 2013, Sima et al. , 2013, Solo, 1999). There are also reports of small-scale private operators within sanitation and solid waste collection (Kassim and Ali, 2006, Mwasumbi, 2004, Van der Geest and Obirih-Opareh, 2009). Most of these studies are sectoral in scope, and focus on one particular service. This paper offers comprehensive case studies exploring how residents engage in development and improvement of a wide array of services and infrastructures, making it possible to gain a more holistic understanding of how residents in the peripheries manage to make their settlements liveable.

Context: Urban growth and spatial expansion of Dar es Salaam

Dar es Salaam is the largest city and de-facto capital of Tanzania. Administratively, Dar es Salaam consists of three municipalities; Kinondoni, Temeke and Ilala. Combined, the total territory is 1624 sq.km. (Andreasen, 2013). With a total population count of 4.4 million in 2012, it is a large city in the context of sub-Saharan Africa (NBS, 2013). Dar es Salaam's population grew at a breath-taking pace of 5.8 % per year on average in the most recent inter-census period from 2002-2012 (NBS, 2006, 2013). This is a continuation and acceleration of historically rapid growth trends.

To a large extent population growth has translated into spatial expansion. Sprawl was noted as a central feature of Dar es Salaam's urban form already around the time of independence (de Blij, 1963). Since then the surface area of the city has increased dramatically (Olvera et al. , 2003). Recent population growth has also resulted in widespread spatial expansion (Andreasen, 2013). The total built-up areas of Dar es Salaam increased by 133 % during 2002-2011, while the population only increased with 75 % during 2002-2012

(Macchi et al. , 2013). The spatial form of the city is highly inefficient in terms of infrastructure and service provision (Hill et al. , 2014). To a large extent expansion is happening informally and unguided by planners (Kironde, 2000, Kironde, 2006, Kombe, 2005). In total, an estimated 80 % of Dar es Salaam's territory is informal (UN-Habitat, 2010).

Investments in urban infrastructure and services are highly inadequate and have not kept pace with the demographic and spatial growth of the city (Myers, 2014, Olvera, Plat, 2003, Sarzin and Raich, 2012). The majority of peripheral settlements are un-serviced by networked infrastructure (Allen, Dávila, 2006, Hill, Hühner, 2014, Mwakalila, 2007). The road infrastructure and the public transport system are insufficient and unable to cope with the spatial growth of the city (JICA, 2008, Melbye et al. , 2015, Olvera, Plat, 2003).

Data collection

This paper is based on in-depth case studies of five selected residential areas, four of which are new, developing peripheral areas, while one could be considered a formerly peripheral area, which is today more consolidated and located closer to the centre. The selection of case study areas is based on an analysis of spatially disaggregated population data for Dar es Salaam from the two most recent censuses, indicating which parts of the city experienced most rapid population growth (Andreasen, 2013). All the selected case study areas have experienced both very high population growth rates, around or higher than 10 % per year in 2002-2012 period, as well as significantly increased population densities. As such the selected areas are extreme cases of rapid urban population growth. They are areas of radical urban transformation, which are considered problematic from a planning perspective. Extreme cases are often rich in information, well-suited for in-depth learning and likely to produce advanced understanding (Flyvbjerg, 2006). Selection of the specific case study areas took place in consultation with planners at municipal and ward-level and sought to ensure variation in relation to population densities and socio-economic status of residents, inclusion of areas from all three municipalities as well as inclusion of informal as well as formally surveyed areas. Table 1 provides an overview of the selected case study areas.

All five areas have transformed from sparsely populated rural or peri-urban areas dominated by bush and agricultural land-use to more densely developed residential areas forming part of the contiguously built-up urban area. Expansion was typically initiated by a first wave of newcomers buying land and developing houses, predominantly self-built, owner-occupier, single-household houses. In informal areas expansion was facilitated by informal subdivision processes and land sales. In the smaller pockets of surveyed land expansion was facilitated and guided by a formal surveying and subdivision process. Alongside the homebuilders many other newcomers were also attracted to the areas, preliminarily house caretakers as well as relatives and extended family members of the homebuilders, later also numerous tenants, as some homeowners developed parts of their properties into rental accommodation.

Fieldwork was conducted between November 2013 and May 2014. Data consists of focus groups with long-term residents in each case study area, many of which were indigenous and/or lifelong residents engulfed by urban expansion processes. The focus groups were concerned with creating a shared narrative of the various changes that the settlements had undergone in relation to housing, services and infrastructure. This was supplemented with observations of the urban environment and interviews with relevant local key informants such as local leaders, larger investors and informal land brokers in each area. A total of 29 residents participated in focus groups and another 29 residents participated as key informants across the five case study areas. The paper also draws on a round of semi-structured interviews with a total of 174 individual residents spread fairly evenly across the five case study areas. In the interviews we gathered information about the various ways in which residents accessed services and their perceptions of the quality of these services. Furthermore, data collection was supplemented with interviews with 13 urban planners from various central agencies and authorities involved in urban planning and service provision in

Dar es Salaam. Most interviews were taped and fully transcribed, though a few were transcribed based on written notes. All transcripts were systematically analysed for concepts and coded using Nvivo software.

Table 1. Selected case study areas

	Ununio	Mzinga	Br. Mwinyi	Mjimwema	Maji Matitu B
Income levels	High	Mixed	Low	Mixed	Low
Population density	Low	Low	Very high	Very low	Medium
Status of the land	Completely surveyed	Mostly informal, with a small area of surveyed land	Completely informal	Mostly informal, with a small area of surveyed land	Completely informal
Dominant building types	Large single-family villas	Varying sizes of single-family houses	Small single-family and commercial houses for tenants	Varying sizes of single-family houses	Small single-family houses
Start of subdivision processes	Late-1990s	Late-1990s	1980s	Early-2000s	Early-2000s
Administrative status	Sub-ward of Kunduchi Ward, Kinondoni Municipality	Sub-ward of Kitunda Ward, Ilala Municipality	Sub-ward of Kilakala Ward, Temeke Municipality	Sub-ward of Mjimwema Ward, Temeke Municipality	Sub-ward of Charambe Ward, Temeke Municipality
Geographical location	App. 20 km north of the city centre along the coast	App. 15 km south-west of the city centre	App. 8 km. south-west of the city centre	App. 8 km south of the city centre on Kigamboni peninsula	App. 13 km south of the city centre
Total population¹	App. 4000	App. 20,000	App. 18,000	App. 6500	App. 13,000
<small>¹) Population counts for sub-wards have not been released from the 2012 census yet. Instead the total population counts are estimates from local leaders. Though for Br. Mwinyi estimate is based on the 2002 census population count and the 2002-2012 average annual growth rate for Kilakala ward.</small>					

Piecemeal and differentiated development of services and infrastructure post-settlement

This section offers an account of the emergence of services and infrastructure in the case study areas based on a systematic comparison of the settlement narratives developed in the focus group interviews. The accounts are often ambivalent and contradictory, pieced together as they are from long-time memories of many different individuals. Nonetheless it is possible to identify a number of common features in the narratives of the settlements, which will be presented in this section, while also highlighting significant differences between the case study areas.

Services and infrastructure were generally not in place in the case study areas before sub-division processes started. The first wave of newcomers tends to describe the land they originally bought as undeveloped and inaccessible, “complete bush”, “very rough” or “wild nature”. There was no electricity network, no water supply, no sewage system, no public transport and only a few rough tracks. Residents at the time relied on shallow wells and surface water. To access public transport, they had to walk or catch a ride to the nearest

main radial road. Interestingly, this is a common trait in the narratives of all areas, both informal and formally surveyed areas. While the surveying processes ensured that land was put aside for roads, utility corridors and communal facilities, these services were not provided as part of the surveys.

Over time services and infrastructure emerged and improved significantly in all settlements. The first newcomers commonly narrate great changes in terms of service provision from the time they bought their land till the time of fieldwork. While most did not consider services much in relation to their settlement choices initially, they often had expectations that services and infrastructure would develop later, stemming from a widespread understanding that services and infrastructure follows population growth. While there seems to be some truth to this notion, the current levels of service provision are highly differentiated both within and between the different areas. Table 2 provides a crude overview of service provision levels in each case study area at the time of fieldwork, while table 3 provides a very condensed summary of residents' perceptions of the quality of services in each area.

Access to electricity has improved significantly in all five areas. Electricity typically started spreading into the areas in the years after subdivision processes began. Mjimwema is an exception, as electricity was already present along the outlet roads before subdivision processes started, likely because of the long-term presence of larger stone-quarries in the area. Residents in all areas expressed widespread satisfaction that most of the land is now covered by the electricity network, even though not all households had chosen to connect themselves, either for financial or other reasons. Only smaller pockets of surveyed land in the most interior parts of Mjimwema and Mzinga were not yet electrified at the time of fieldwork. Not surprisingly, residents in all areas also expressed dissatisfaction with the instability in supply as well as the notorious power cuts plaguing residents all over Dar es Salaam.

Access to water has also improved significantly in all areas. Ununio is a major exception in relation to water provision, as the central water authority, Dar es Salaam Water and Sewerage Authority (DAWASA), drew a pipeline through the area around 2003. In the four other case study areas the main source of water is a mixture of private and communal boreholes drawing on groundwater resources. Some residents have drilled their own boreholes, while others connect themselves or purchase water in buckets from neighbours' or communal boreholes. In all these four areas residents expressed dissatisfaction with the lack of communal boreholes. Furthermore, in three of the case study areas residents expressed concerns about the quality and safety of their groundwater. Only in Mzinga residents satisfaction with the quality of their groundwater, which was considered safe and very tasty. Residents in Ununio expressed widespread satisfaction with the water provision from DAWASA, a service quite exceptional in a peripheral settlement. Geographically Ununio is fortuitously located near a main transmission pipe running from one of the major water treatment plants in Bagamoyo. As a surveyed area located along the fashionable northern coast, Ununio has attracted a high share of resourceful residents, many of which are high-ranking government officials, who likely made the extension economically feasible from DAWASA's perspective and probably also played a major role in lobbying for the transmission pipe.

All case study areas remain outside of the central sewage system, so residents rely on private on-site sanitation facilities. In the four peripheral areas residents generally do not consider sanitation an issue of great concern, because of the relatively low population densities. In the more central and consolidated area of Br. Mwinyi residents express concerns about possible health hazards and contamination of groundwater because of the high population density of the area.

Transport services and infrastructure has improved significantly in all areas. All areas have experienced improvements of the outlet roads connecting to one of the radial roads as well as increased servicing by the minibuses that make up the public transport system in Dar es Salaam. Despite improvements, transport services and infrastructure is subject to widespread dissatisfaction across all five case study areas. Transport services and infrastructures are highly differentiated between the different case study areas. In Br. Mwinyi, intense densification has resulted in very poor accessibility and the area is quite poorly serviced

by public transport, despite high population densities and relative proximity to the city centre. In Mjimwema, the main outlet roads were actually tarmacked and serviced by public transport even before subdivision processes started, likely because of the long-term presence of the stone-quarries. On the other hand, Mjimwema residents suffer from their location on the Kigamboni peninsula, which is only connected to the city centre by an insufficient ferry service. In Mzinga, the unfortunate geography of the area means that roads are notoriously rough and subject to severe waterlogging. Piecemeal improvements of the outlet road has increased accessibility and attracted public transport services to some extent, but nonetheless the interior parts remain poorly serviced. In Maji Matitu B, a more fortunate geography means that roads are quite trafficable and despite interior location the area has been quite well-served by public transport for a long time. Ununio has only recently been serviced by public transport following the tarmacking of the main outlet road, which has drastically improved accessibility of the area.

The municipal authorities are present in all the case study areas in relation to provision of health and education services such as primary schools and dispensaries. At the time of fieldwork these services were locally available in all areas, if not within the sub-ward, then within the larger ward. Across all five case study areas health and education services are subject to widespread dissatisfaction as they are considered severely under-supplied and of poor quality.

Table 2. Overview of service and infrastructure provision levels in the case study areas

	Ununio	Mzinga	Br. Mwinyi	Mjimwema	Maji Matitu B
Electricity	Provision through the central electricity utility. Unstable supply and regular cuts.	Provision through the central electricity utility, though small pockets of interior land remains unconnected. Unstable supply and regular cuts.	Provision through the central electricity utility. Unstable supply and regular cuts.	Provision through the central electricity utility, though small pockets of interior land remains unconnected. Unstable supply and regular cuts.	Provision through the central electricity utility. Unstable supply and regular cuts.
Water provision	Provision through the central water utility DAWASCO.	Private and communal boreholes.	Private and communal boreholes.	Private boreholes and one communal borehole.	Only private boreholes.
Sanitation	No central sewage system. On-site sanitation solutions.	No central sewage system. On-site sanitation solutions.	No central sewage system. On-site sanitation solutions.	No central sewage system. On-site sanitation solutions.	No central sewage system. On-site sanitation solutions.
Public transport	Serviced by minibuses along the outlet road, but not in the interior parts.	Serviced by minibuses, though insufficiently in the interior parts of the area.	Serviced by minibuses, though insufficiently in the interior parts of the area.	Serviced by minibuses along the outlet roads, but not in the interior parts. Connected to the city centre through a ferry service.	Serviced by minibuses, also in the interior parts of the area.
Outlet roads	Recently tarmacked and in good condition.	Partly tarmacked. The un-tarmacked part is very rough and subject to water-logging.	Tarmacked, though subject to intense traffic congestion.	Tarmacked and of fairly good quality.	Tarmacked, though of poor quality. Undergoing improvement and expansion to dual-lane road.

Interior access roads	Accessibility is good. Roads are rough, but wide, well-organized and in a fairly good condition.	Accessibility is limited. Roads are very rough and subject to severe water-logging.	Accessibility is poor. Roads are rough, very narrow and subject to water-logging.	Accessibility is limited. Roads are rough and subject to water-logging.	Accessibility is fairly good. Roads are rough, but not subject to water-logging.
Health and education services	Present within the sub-ward.	Present within the ward, but no primary school within the sub-ward.	Present within the ward, but no primary school within the sub-ward.	Present within the sub-ward, though unable to cope with demand.	Present within the sub-ward, though unable to cope with demand.

Table 3. Residents' perceptions of the quality of services

	Ununio	Mzinga	Br. Mwinyi	Mjimwema	Maji Matitu B
Electricity	Satisfaction with electrification, but dissatisfaction with instability and regular cuts.	Satisfaction with electrification, though residents in the interior areas complain about being outside the network.	Satisfaction with electrification, but dissatisfaction with instability and regular cuts.	Satisfaction with electrification, though residents in the interior areas complain about being outside the network.	Satisfaction with electrification, but dissatisfaction with instability and regular cuts.
Water provision	Satisfaction with DAWASCO services, which are considered quite reliable.	Widespread satisfaction with the groundwater quality, which is considered safe, reliable and tasty.	Dissatisfaction with under-supply and long queues at the communal wells. Concerns about the safety of the groundwater.	Dissatisfaction with the lack of communal wells and the quality of the groundwater considered too salty for drinking.	Dissatisfaction with the lack of communal wells and the quality of the groundwater considered too salty for drinking.
Sanitation	Not an area of concern for residents due to the low population density.	Not an area of concern for residents due to the low population density.	Concerns related to the high population densities, health hazards and contamination of groundwater.	Not an area of concern for residents due to the low population density.	Not an area of concern for residents due to the low population density.
Public transport	Dissatisfaction with the lack of busses, particularly early in the morning.	Dissatisfaction with the insufficient bus services into the interior areas, off the main radial road.	Dissatisfaction with the lack of busses as well as the lack of a direct bus route to the city centre.	Satisfaction with the bus services along the outlet roads, but dissatisfaction with the lack of bus services in the interior parts as well as the congestion at the ferry.	Satisfaction that busses do service interior parts. Dissatisfaction with the overcrowding as well as the low quality of busses.
Outlet roads	Widespread satisfaction with the good quality of the outlet road.	Satisfaction with the tarmacked section of the outlet road, and dissatisfaction with the interior, un-tarmacked section.	Dissatisfaction with the intense traffic congestion.	Widespread satisfaction with the quality of the outlet roads.	Dissatisfaction with the quality of the road, though great expectations for the on-going improvements.
Interior roads	Widespread satisfaction with the accessibility of the area and the	Dissatisfaction with the limited accessibility and	Dissatisfaction with the poor accessibility and the poor quality of interior roads.	Dissatisfaction with the limited accessibility and the	Satisfaction with the fairly good accessibility and the soil type making

	quality of interior roads.	the poor quality of interior roads.		poor quality of interior roads.	interior roads less prone to water-logging.
Health and education services	Widespread dissatisfaction. Considered under-supplied and of poor quality.	Widespread dissatisfaction. Considered under-supplied and of poor quality.	Widespread dissatisfaction. Considered under-supplied and of poor quality.	Widespread dissatisfaction. Considered under-supplied and of poor quality.	Widespread dissatisfaction. Considered under-supplied and of poor quality.

Self-help services: Residents' informal solutions

This section explores how residents engage in development of services and infrastructure in their settlements. The findings presented are predominantly based on the analysis of the semi-structured interviews with individual residents in relation to how they accessed various services. This gave insights into the wide variety of solutions residents to varying degrees are able to create, organize and finance themselves, as well as the challenges and difficulties residents associate with these informal modes of service provision.

Individual self-help services are evident in the widespread reliance on private on-site sanitation facilities, as well as the practice of drilling private boreholes. Many of the owners of private boreholes function as informal water vendors, supplying water to their neighbours through pipe connections or by the bucket. Informal water vending ranges from small-scale sharing arrangements between next-door neighbours to larger, well-organized, commercial operations. Likely it is the most important mode of water provision in all areas, except Ununio. More communal self-help solutions are evident around the management of communal boreholes in Br. Mwinyi, Mzinga and Mjimwema, as well as in the coordination surrounding the creation of interior access roads in informal areas. There is also some anecdotal evidence of residents communally undertaking small-scale improvements of interior access roads, such as levelling and filling up pot holes.

Simone warns us that we should be careful not to romanticize the resourcefulness of residents; people do what they do in lack of better options (Simone, 2010). The findings from the case study areas indicate that informal self-help services are often costly and place huge strains on the residents' time and resources. Particularly homeowners often invest considerable resources in servicing their own properties, as well as much time and energy on collaborating with neighbours concerning communal solutions. The financial burden of self-help services has also been remarked on in other studies of peripheral urban settlements (Gough, 1999, Sawyer, 2014). Developing self-help services is not necessarily considered an attractive mode of provision by residents either. For example in relation to self-help water provision, residents generally consider boreholes more attractive than the shallow wells of the past, but there are still widespread concerns about the quality and safety of the local groundwater. Only in Mzinga residents expressed satisfaction with the quality of their water, to an extent where they feel comfortable drinking it and would prefer it over the formal water provision network. In all other areas residents raise health and safety concerns and complain about saline groundwater. In Br. Mwinyi concerns are specifically related to contamination of the groundwater from on-site sanitation solutions, as the area has undergone intense densification in recent years. Health and safety concerns have also been voiced in previous studies of self-help water and sanitation solutions in urban areas (Allen, Dávila, 2006, Chakava, Franceys, 2014, Manzungu

and Chioreso, 2012, Njoh, 2013, Nnaji, Eluwa, 2013, Van Dijk, Etajak, 2014, WB and IMF, 2013). In relation to the management of the communal boreholes in some of the case study areas, there are tales of conflicts, mismanagement, maintenance problems and rumours of swindling with funds. Other studies have also noted that communal self-help solutions can give rise to conflicts and power struggles between neighbours (Gough, 1999, Ibem, 2009, Keener, Luengo, 2010).

The private and communal nature of self-help services results in major inequalities in access to services and highly differentiated service provision levels, not just between the different case study areas, but also within each settlement. This has also been noted in other studies of self-help services (Gough, 1999, Jaglin, 2008, Kassim and Ali, 2006). In the case study areas access to water and sanitation services can vary significantly between next-door neighbours, and even within the same compound between the landowner's family and various tenants. Some are able to install hygienic septic tank-based sanitation facilities and undertake regular maintenance and proper waste management; others may rely on a simple pit latrine and empty it on the streets during the rainy season. Some are able to drill private boreholes on their compounds; others have to purchase water at prices set by vendors in a not very competitive market. Those who cannot afford to invest in self-help services have to resort to free, but unsafe, solutions such as shallow wells, surface water and open defecation. Informal coordination around interior access roads has not been equally successful in all areas, e.g. in Maji Matitu B, residents have been fairly successful in coordination concerning access roads, ensuring that the general accessibility of the area is quite good, whereas in Br. Mwinyi, vast parts of the area are inaccessible to motorized transport. Those residents able to drive 4W cars and outfit their properties with private boreholes and hygienic sanitation facilities can enjoy a relatively comfortable lifestyle in the periphery, and obviously feel much less pestered by the deficits in formal service provision.

Post-settlement network extensions: Attracting formal service providers

This section explores how residents engage with formal service providers to attract formal services and infrastructure to their settlements. The findings are predominantly based on the analysis of the semi-structured interviews with individual residents in relation to how they accessed various services. This gave insights into the variety of strategies that residents apply in order to attract formal services providers as well as the challenges and difficulties associated with extending formal services and infrastructures post-settlement.

The comprehensive, non-sectoral approach of this study makes visible that residents are not only investing in self-help solutions, but also put considerable effort into attracting formal service providers to their settlements. The presence of formal service providers is most evident in relation to electricity, public transport, creation and maintenance of outlet roads as well as in relation to health and education services. This is perhaps because these types of services and infrastructures are not easily organized through self-help. Only the wealthier residents have been able to invest in private cars, generators, solar panels and private health and education services, but most residents simply tolerated severe deficits for many years, while waiting for formal network extensions.

The formal service providers primarily took a reactive role, responding to demand, requests and pressure from residents. Therefore residents were often very actively involved in attracting the formal service providers through applications and co-financing of network extensions. Interestingly, informality of tenure has not prevented residents from pursuing strategies of formal network extensions. In relation to electricity, network extensions are primarily the result of numerous applications from residents to the formal utility, Tanzania Electricity Supply Company Limited (TANESCO), in combination with a substantial amount of co-financing of the network extension on the side of the customers. Applying for electricity extensions can be an arduous task, requiring a good deal of patience and often also good connections or extra payments. Nonetheless TANESCO is the formal service provider most visibly present in the periphery,

and the utility was often the first formal service provider to extend the network into the case study areas. In relation to public transport, the minibuses are owned by private operators, but regulated by the Surface and Marine Transport Regulatory Authority (SUMATRA), which licenses vehicles, surveys routes and fixes the fares. The public transport system has, to some extent, responded to demand from the growing populations in the case study areas, but as the prices are fixed, there has to be a certain volume of customers for a new route to be profitable. Therefore, public transport spread into the case study areas somewhat later than electricity.

Network extensions often happened in a disintegrated way, and seemingly unrelated to any overall spatial planning. For example, electrification typically happened through numerous piecemeal and gradual extensions, where homeowners applied for and financed extensions either individually or in smaller groups of nearby neighbours. This made cost-sharing arrangements somewhat opaque, as those first to apply often had to finance much longer network extensions from nearby electrified areas or main roads, while those following later could more easily connect from there. Only in Maji Matitu B, extension was organized communally, where all homeowners collectively applied for and financed the electrification of the area. Road improvements have also happened piecemeal. The outlet roads often started out as footpaths or smaller beaten tracks, which were gradually widened and improved, often over several rounds, and likely in relation to the roads being formally re-categorized and responsibilities shifting from sub-ward level to municipal authorities to the state. The result of this gradual improvement process is outlet roads that rarely follow the most efficient routes. The public transport system is infrastructure-sensitive and responds to the availability and quality of roads. Therefore extension of minibus services also happened gradually and piecemeal, often closely following improvements of the outlet roads. Because of the reactive and piecemeal approach of network extensions, society may be missing out on potential benefits of scale. Another study has noted that financing fragmentary network extensions post-settlement is more costly than it would have been to proactively deal with new urban growth (Sarzin and Raich, 2012).

Post-settlement network extensions were often complicated by the lack of overall spatial planning in the informal areas, meaning that housing development happened without land set aside for roads, utility corridors and communal facilities. Land is a crucial issue in relation to roads, as post-settlement widening and upgrading often requires acquisition of already developed land. As settlements grew in terms of population and the outlet roads rose up through the road categorizations, the land requirements for the roads also grew. Land is also a problem in relation to post-settlement provision and expansion of health and education services. E.g. in relation to primary schools, residents in all areas complained that rapidly increasing pupil numbers are squashed into ever more cramped locales. Land is also an issue in relation to utility corridors, as they often follow the access roads. For example, residents have to get permissions from neighbouring landowners to draw electricity lines across their properties. Alternatively they have to draw the line around neighbouring properties, often increasing the costs of extension and creating a visual mess. In contrast to this it has been relatively simpler to extend both water and electricity networks post-settlement in Ununio, because the surveying process ensured that land had been set aside for access roads and utility corridors.

Service provision is a highly politicized issue and formal network extensions are often also the result of some degree of lobbying efforts towards urban authorities and formal service providers. E.g. in Ununio, residents highlight that their parliamentary representative played a central role in attracting the water pipeline to the area. In Mzingu, their parliamentary representative played a crucial role in *"insisting on the process, whenever it failed,"* when residents applied for electricity. Local leaders often explained how they would organize community meetings around service provision and *"communicate community needs"* towards the municipal authorities. Lobbying the municipal authorities is also a way to tap into funds from international development projects, which often work with the municipal authorities. Roads are an especially politicized issue, because of the dual management system, where smaller roads are the responsibility of municipal authorities, while larger roads are under Tanzania National Roads Agency

(TANROADS). Principally a road has to meet certain criteria to be placed under TANROADS, but in practice there is a lot of politics in road categorization, as a central planner explained: *“If you go road by road here in Dar es Salaam, there are some roads which do not qualify to be where they are [with TANROADS], but there has been put some pressure somewhere. This is how it is.”* The outlet roads in Ununio, Maji Matitu B and Mjimwema are all currently under TANROADS, and remarkably they are also the outlet roads in the best conditions.

The reactive and politicized nature of post-settlement network extensions creates and reinforces inequalities in access to services. The extent, speed and quality of network extensions differentiate significantly between the different case study areas, and often also internally within each settlement. This reflects geography to some extent, as those residing in the most interior parts of the case study areas are able to attract network extensions last. However, it also reflects that some individuals or groups of residents are simply more skilled and successful in playing the politics of service provision; they are better organized, more well-connected or can afford to pay higher bribes. Among the case study areas, Ununio stands out in particular as an island of quite good service provision levels among otherwise severely under-served peripheral settlements, bearing testimony to the wealth, resourcefulness and good connections of Ununio’s residents.

Conclusions

This paper offers insights from recent case studies of new, rapidly growing peripheral settlements of Dar es Salaam exploring how services and infrastructure have developed and improved over time, and how residents have been engaged in this process in various ways.

This paper contributes to an emerging research agenda, taking as its starting point not the failures of urban service provision, but how urban services actually work (Bierschenk and de Sardan, 2014, Blundo and Le Meur, 2009, Jaglin, 2014, Pieterse, 2008, 2014, Pieterse and Hyman, 2014, Simone, 2010, 2014). Other studies of urban peripheries in sub-Saharan Africa have noted the prominent role of residents in organizing and improving infrastructure and services, but these studies have rarely focused on this phenomenon as the main object of investigation (Buire, 2014, Burra, 2004, Gough, 1999, Ibem, 2009, Kombe, 2000, Kombe, 2005, Kyessi, 2005, Owens, 2010, Sawyer, 2014). Other studies have also explored how residents in urban peripheries access particular services, but many of these have been sectoral in scope and focused on only one particular service (Allen, Dávila, 2006, Chakava, Franceys, 2014, Chitonge, 2014, Kassim and Ali, 2006, Keener, Luengo, 2010, Kyessi, 2005, Manzungu and Chioreso, 2012, Mwakalila, 2007, Njoh, 2013, Nnaji, Eluwa, 2013, Sima, Kelner-Levine, 2013, Solo, 1999, Van der Geest and Obirih-Opareh, 2009, Van Dijk, Etajak, 2014). This paper offers comprehensive case studies of selected settlements, exploring how residents engage in development and improvement of a wide array of services and infrastructures. This makes it possible to gain a more holistic understanding of how urban services work and how residents manage to make their settlements liveable through a broad range of different strategies.

Services and infrastructure were seldom in place in the case study areas before housing development. Interestingly, this goes for both informal as well as formally surveyed peripheral areas. Services and infrastructures have emerged and improved significantly over time as the areas consolidated, though the current levels of service provision are highly differentiated both within and between the different case study areas. The gradual improvements in services and infrastructure are to some extent created, organized and financed by residents through various informal self-help solutions, particularly in relation to water, sanitation and interior access roads. The holistic approach highlights that formal service providers are also, to some extent, filling the gaps created by their own failures to proactively plan for new urban growth, esp. in relation to electricity, public transport, outlet roads and health and education services. The formal providers primarily take a reactive role, responding to demand, requests and political pressure from residents. Therefore, residents are often actively involved in attracting the formal service providers through

applications, co-financing of network extensions, as well as lobbying efforts towards urban authorities and formal service providers.

On the positive side one can acknowledge and celebrate the entrepreneurial spirit, the capacities and the resourcefulness of residents in making their settlements liveable. On a more cautious note, it is also important to recognize the limits to informal self-help services, as well as the challenges related to post-settlement extension of formal networks. Informal self-help services are costly and place huge strains on residents' time and resources. Developing self-help services is not necessarily considered an attractive strategy by residents; it is what they do in lack of better options. Certainly the efforts put into attracting urban service providers suggest that residents often consider the formal solutions more viable. Post-settlement network extensions are often complicated and impeded by costly and cumbersome land-acquisition processes, especially in informal settlements, where the absence of overall spatial planning means that no land has been set aside for roads, utility corridors and communal facilities. Because of the reactive and often piecemeal approach of network extensions, society may be missing out on potential benefits of scale. The way urban services work also means that the provision of services and infrastructure is extremely fragmented and localized across the urban territory, creating and reinforcing major inequalities in access to services.

Recommendations

- Major efforts are needed in order to expand networks post-settlement in already developed peripheral areas. Planners may need to move away from the ideal of “the full package” of formal service provision, at least in an intermediate period. Substantial improvements in access and service quality could be achieved through facilitating and supporting residents' efforts and informal self-help solutions.
- Formal service providers could play a role in improvement of local boreholes and on-site sanitation solutions in relation to e.g. enforcing health and environmental standards, observing groundwater resources to avoid depletion, monitoring groundwater quality, facilitating proper waste disposal and penalizing non-compliance.
- Formal service providers should pursue post-settlement network extensions communally, rather than individualized, piecemeal extensions; facilitating and coordinating communal applications, ensuring fair cost-sharing arrangements and equality in access.
- Urban planners should play a role in facilitating local, informal land management practices; working with local residents to set aside land for roads, utility corridors and communal facilities and creating institutions for monitoring and penalization of non-compliance.
- Needless to say, urban planners and formal service providers need to deal with new urban growth more proactively; considering and planning for services and infrastructure in newly, developing peripheral areas before they become too developed. Local plans should at the minimum ensure that land is set aside for infrastructure and services to be developed later.

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